SIMGRO 4.1.2 Input and output

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P.E. Dik

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ABSTRACT

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The regional hydrologic model SIMGRO is used for investigating various kinds of water management problems, specifically those where the interaction between groundwater and surface waters plays a crucial role. This document describes the input and outfiles.

Keywords: finite element model, regional hydrology, simulation, water management.

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DWK-Programme 417

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1 Introduction

The documentation of SIMGRO consists of several reports:
- SIMGRO Theory and model implementation;
- SIMGRO User's Guide;
- SIMGRO Input and Output.

This report describes the input and output.

2 Input

2.1 Input file descriptions

The specification for the input file descriptions is tabulated below. In all cases, an example is included. If necessary, descriptions are clarified through additional remarks.

Table 2.1Input item characteristics

Item	Description	
Name	name of the parameter or variable	
Format	input format	
Col	column position (tabular input only)	
Unit	unit of the input parameter or variable	
description	brief description of the parameter or variable	
min.	minimum value allowed	
max.	maximum value allowed	
def.	default value	
type	req	: required
	opt	: optional
	req 1/ 2	: either 1 or 2 is required (2 has priority)
error-code	fatal	: error message, execution discontinued
	warning	: warning, execution continues
	set to min/max	: warning, variable set to min or max value

The files are described in appendix 1.

3 Output

3.1 Output file descriptions

The output files are described in appendix 2 (ASCII-files) and 3 (binary files).

Appendix 1 Input files

PARA_SIM.INP (required)

All parameters are stored in file para_sim.inp, in free format.

Time parameters

Parameter format and description

Name	format	unit	description
idbg	F	-	day number to start calculations
iybg	I	-	year number to start calculations
ided	F	-	day number to stop calculations
iyed	I	-	year number to stop calculations
dtgw	F	d	time step for groundwater module
dtsw	F	d	time step for surface water module

Parameter characteristics

name	min.	max.	def.	type	error-code
idbg	0	365/366[1]	-	req	fatal
iybg	0	9999	-	req	fatal
ided	0	365/366[1]	-	req	fatal
iyed	0	9999	-	req	fatal
dtgw	1.0E-02	1.0E+02	1	opt	warning
dtsw	1.0E-03	1.0E+01	0.05	opt	warning

Example

```
IDBG            =       0.00
IYBG            =       1989
IDED            =     180.00
IYED            =       2000
DTGW            =       0.25
DTSW            =       0.01
```

Remarks

The time to begin calculations must be prior to the time to stop calculations.

The maximum day number is 366 for leap years and 365 for the other years.

[1] depending on the year (leapyear or not)

Parameters for modelling processes

Parameter format and description

iofwbk	I	-	calculate back flow (default setting)
iodrly	I	-	calculate drainage for multiple layers
fawa	F	-	correction factor for precipitation
faevsw	F	-	evaporation factor for surface water
frimub	F	-	impermeable fraction of urban area
frimse	F	-	sewered fraction of impermeable area
idbgwlcl	I	-	day number to start water level control
idedwlcl	I	-	day number to stop water level control
dhtasp	F	m	water level below target before sprinkling is prohibited
cmspro	F	mm	total sprinkling gift over rotational period
frirpe	F	-	fraction of sprinkling water that percolates directly
frirev	F	-	fraction of sprinkling water that evaporates directly
frpr	F	-	fraction of time precipitation or sprinkling occurs
kdif	F	-	extinction coeff. diffuse visible light
kdir	F	-	extinction coeff. direct visible light
lyswap	I	-	bottom layer of SWAP-profile

Parameter characteristics

name	Min.	max.	def.	type	error-code
iofwbk	0	1	0	opt	fatal
iodrly	0	1	0	opt	fatal
fawa	0	2.0	1.0	opt	fatal
faevsw	0	2.0	1.0	opt	fatal
frimub	0	1.0	0.4	opt	fatal
frimse	0	1.0	1.0	opt	fatal
idbgwlcl	0	365/366	91[1]	opt	fatal
idedwlcl	0	365/366	244[2]	opt	fatal
dhtasp	0	1.0E+00	0.2	opt	fatal
cmspro	0	1.0E+02	25	opt	fatal
frirpe	0	1.0	0.0	opt	fatal
frirev	0	1.0	0.0	opt	fatal
frpr	0.01	1.0	1.0	opt	fatal
kdif	0	2.0	1.0	opt	fatal
kdir	0	2.0	1.0	opt	fatal
lyswap	1	nuly	1	opt	fatal

[1] start of the growing season
[2] end of the growing season

Example

```
IOFWBK              =            0
IODRLY              =            1
FAWA                =         1.00
FAEVSW              =          1.0
FRIMUB              =         0.45
FRIMSE              =         1.00
IDBGWLCL            =           91
IDEDWLCL            =          274
DHTASP              =         1.00
CMSPRO              =           25
FRIRPE              =         0.00
FRIREV              =         0.05
FRPR                =         0.10
LYSWAP              =            1
IOFWBK              =            0
IODRLY              =            1
```

Remarks

The parameters *frimub* and *frimse* are fractions relative to the urban area as defined in *land_use.inp* (*ipagte = 5)*.

The parameter *fawa,* the correction factor for precipitation, increases the precipitation rate with that factor (the real precipitation is usually greater than the measured precipitation).

If no crop factor for the surface water is defined in *FACT_SIM.INP*, the surface water evaporation rate is assessed using *faevsw*.

The amount of sprinkling that is applied to the root zone is reduced with a factor *(1-(1-frirev).(1-frirpe))*.

The parameter *frpr* defines the precipitation and sprinkling intensity. When this intensity exceeds the infiltration capacity surface storage or runoff will occur (this parameter is independent of the groundwater time step).

The parameter *iofwbk* is also specified in *goto_sim.inp*. When in *goto_sim.inp* a value is specified, this value overrules the default settings. For example when in *para_sim.inp* the default value for *iofwbk* is set on 0 and in *goto_sim.inp* for a certain watercourse on 1, this results in the value 1 for the specified watercourse. When in *goto_sim.inp* no value is specified the default is used.

Option descriptions

iofwbk	0	no back flow calculated (default)
	1	back flow calculated

iodrly	Drainage from	Drainage resistances *redr* and *rein*
-1	Layer 1	Calculate within executable
0	Layer 1	Use values from drng_nod.inp
1	All intersecting layers	Calculate within executable
2	All intersecting layers	Redr = 0 and Rein = 0 (only entry and exit resistance)

Parameters for numerical approximation

Parameter format and description

name	format	unit	description
dhmxnd	F	m	maximum tolerance in head per node for iteration
dhmxsw	F	-	maximum change in surface water level over dtsw
wpit	F	-	weighting parameter of previous time step
nxit	I	-	maximum number of iterations
famxcv	R	-	threshold convergence factor
farxcv	R	-	overrelaxation factor for convergence
farxdv	R	-	overrelaxation factor for divergence
farxin	R	-	initial overrelaxation factor
farxmn	R	-	minimum overrelaxation factor

Parameter characteristics

name	min.	max.	def.	type	error-code
dhmxnd	1.0E-10	2.0E-02	1.0E-03	opt	fatal
dhmxsw	0	1.0E+01	0.25	opt	fatal
wpit	0	1	0.55	opt	fatal
nxit	20	99999	40	opt	fatal
famxcv	0	2.	1	opt	fatal
farxcv	0	2.	1.1	opt	fatal
farxdv	0	1.	0.8	opt	fatal
farxin	0	2.	1.375	opt	fatal
farxmn	0	1	0.5	opt	fatal

Example

```
      DHMXND          =      0.003
      DHMXSW          =       0.05
      WPIT            =       1.00
      NXIT            =        100
      FAMXCV          =       1.00
      FARXCV          =       1.10
      FARXDV          =       0.80
      FARXMN          =       0.20
      FARXIN          =       1.38
```

Remarks

Ill-defined initial conditions may cause the model to be unstable during first time steps. In order to reduce the risk of instability, the user is recommended to specify relatively tolerant (i.e. high) values of dhmxnd and nxit for the first model run.

The convergence of the iteration procedure depends on overrelaxation. It is possible to reduce the number of iterations by choosing the right factors. Speeding up the computational procedure may however introduce water balance errors.

Parameters for output options

Parameter format and description

name	format	unit	description
dtpt	F	d	time step for regular output
ioptnd	I	-	output water balance per nodal subdomain
ioptsb	I	-	output water balance per subcatchment
ioptly	I	-	output water balance per layer
ioptdb	I	-	database output (also used for ICDS)
ioptms	I	-	writing messages
ioptmi	I	-	writing output for Microfem
ioptin	I	-	writing input
ioptit	I	-	writing iteration results
iopttn	I	-	writing bi-monthly output
ioptwbal	I	-	writing water balance output
ioptwbsa	I	-	writing saturated water balance output
ioptwbsw	I	-	writing surface water balance output
ioptwbun	I	-	writing unsaturated water balance output
ioptswap	I	-	writing output for SWAP
Iodbug	I	-	writing debugging information
Ioptgw	I	-	writing groundwater and surfacewaterlevels per dtpt
ioptsw	I	-	writing outgoing surface water fluxes
ioptdu	I	-	writing input for DUFLOW
head01	A	-	title 1 for output file hhgw_nod and hhgw_sub
head02	A	-	title 2 for output file hhsw_nod and hhsw_sub
iopth0	I	-	writing fluxes per node
ioicds	I	-	ICDS output

Parameter characteristics

name	min.	max.	def.	type	error-code
dtpt	1.0E-01	1.0E+02	1.0	opt	fatal
ioptnd	0	1	0	opt	fatal
ioptsb	0	1	0	opt	fatal
ioptly	0	1	0	opt	fatal
ioptdb	0	1	0	opt	fatal
ioptms	0	2	0	opt	fatal
ioptmi	0	1	0	opt	fatal
ioptin	0	1	0	opt	fatal
ioptit	0	1	0	opt	fatal
ioptir	0	1	0	opt	fatal
iopttn	0	1	0	opt	fatal
ioptwbal	0	1	0	opt	fatal
ioptwbsa	0	1	0	opt	fatal
ioptwbsw	0	1	0	opt	fatal
ioptwbun	0	1	0	opt	fatal
ioptswap	0	1	0	opt	fatal
iodbug	0	1	0	opt	fatal
ioptgw	0	3	0	opt	fatal
ioptsw	0	2	0	opt	fatal
ioptdu	0	1	0	opt	fatal
head01	-	-	-	opt	-
head02	-	-	-	opt	-
iopth0	0	1	0	opt	fatal
ioicds	0	1	0	opt	fatal

Example

```
      DTPT              =          1.00
      IOPTIR            =             0
      IOPTDP            =             0
      IOPTM3            =             0
      IOPTTN            =             0
      IOPTIN            =             0
      IOPTIT            =             1
      IOPTMI            =             0
      IOPTLY            =             1
      IOPTND            =             0
      IOPTSB            =             0
      IOICDS            =             1
      IOPTMS            =             1
      IOPTHO            =             0
      IOPTWBAL          =             0
      IOPTWBSA          =             0
      IOPTWBSW          =             0
      IOPTWBUN          =             0
      IOPTDB            =             1
      IOPTSWAP          =             0
      IODBUG            =             0
```

Remarks

The combination of the options 'ioptnd', 'ioptsb', 'ioptly' and on the other hand 'ioptwbal', 'ioptwbsa', 'ioptwbsw', 'ioptwbun' determines which output files will be generated.

Specification of output files on periodical base

	ioptnd=1	ioptsb=1	ioptly=1
ioptwbal=1	wbalpnod.out	wbalpsub.out	wbalplay.out
ioptwbsa=1	wbsapnod.out	wbsapsub.out	wbsaplay.out
ioptwbsw=1	wbswpnod.out	wbswpsub.out	wbswplay.out
ioptwbun=1	wbunpnod.out	wbunpsub.out	wbunplay.out

Specification of output files on daily base

	ioptnd=1*	ioptsb=1**	ioptly=1***
ioptwbal=1	wbaldnod.out	wbaldsub.out	wbaldlay.out
ioptwbsa=1	wbsadnod.out	wbsadsub.out	wbsadlay.out
ioptwbsw=1	wbswdnod.out	wbswdsub.out	wbswdlay.out
ioptwbun=1	wbundnod.out	wbundsub.out	wbundlay.out

** : files are only generated when nodes are specified in plwb_nod.inp*

*** : files are only generated when subcatchments are specified in plwb_sub.inp*

**** : files are only generated when layers are specified in plwb_lay.inp*

Option descriptions

ioptnb	0	no water balance output of results per node
	1	water balance output of results per node
ioptsb	0	no water balance output of results per subcatchment
	1	water balance output of results per subcatchment
ioptly	0	no water balance output of results per layer
	1	water balance output of results per layer
ioptdb	0	no icds output
	1	Icds output
ioptms	0	informative messages, warnings and errors
	1	warnings and errors
	2	errors only
ioptmi	0	no output written for MICROFEM
	1	output written for MICROFEM
ioptin	0	no input written to inpt_sim.out
	1	input written to inpt_sim.out
ioptit	0	no output written to iter_sim.out
	1	output written to iter_sim.out
iopttn	0	no output written to hhgw_tno.out
	nxly	output written to hhgw_tno.out for layer number nxly
ioptwbal	0	no output written to wbal*.out files
	1	output written to wbal*.out files
ioptwbsa	0	no output written to wbsa*.out files
	1	output written to wbsa*.out files
ioptwbsw	0	no output written to wbsw*.out files
	1	output written to wbsw*.out files
ioptwbun	0	no output written to wbun*.out files
	1	output written to wbun*.out files
ioptswap	0	no output written for SWAP
	1	output written for SWAP
ioptdbug	0	no debugging information
	1	also writing debugging information to info_sim.out
ioptgw	0	no groundwater levels written
	1	groundwater depths written to gw.* per dtpt
	2	surface water depths written to gw.* per dtpt
	3	both gw and sw depths written to gw.* per dtpt
ioptsw	0	no surface water fluxes written
	1	surface water fluxes written to sw.* per dtpt
	2	fluxes and levels written to sw.* per dtpt
ioptdu	0	no DUFLOW input written
	1	DUFLOW input written to du.* per dtgw
iopth0	0	no fluxes per node written
	1	fluxes per node written to flhopsim.out
ioicds	0	no icds input written
	1	icds input written

NODE_SIM.INP (required)

Variable format and description

COL	format	name	unit	description
1-6	I6	nnex	-	external node number
7-14	F8.2	glnd	m+MSL	soil surface above mean sea level
15-24	F10.1	xc	m	x-coordinate
25-34	F10.1	yc	m	y-coordinate

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
glnd	-1.0E+02	1.0E+03	-	req	warning
xc	0	1.0E+07	-	req	warning
yc	0	1.0E+07	-	req	warning

Example

```
nnex    glnd        xc         yc
< I6 >< F8.0 >< F10.0  >< F10.0  >
     1    7.47  167821.0  440505.0
     2    7.45  167544.0  440565.0
     3   30.41  167764.0  441088.0
     4    8.53  167475.0  440823.0
     5    7.44  167267.0  440625.0
     .     .        .         .
     .     .        .         .
     .     .        .         .
```

Remarks

The minimum distance between two nodes may not be smaller than 1 m.

ELEM_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	neex	-	element number
7-12	I6	ndel01	-	node number 1
13-18	I6	ndel02	-	node number 2
19-24	I6	ndel03	-	node number 3

Variable characteristics

name	min.	max.	def.	type	error-code
neex	1	999999	-	key	fatal
ndel01	1	999999	-	req	fatal
ndel02	1	999999	-	req	fatal
ndel03	1	999999	-	req	fatal

Example

```
neexndel01ndel02ndel03
< I6 >< I6 >< I6 >< I6 >
     1     1     3     4
     2     4     3     7
     3     7     3     6
     4     7     6    11
     5    11     6    10
     .     .     .     .
     .     .     .     .
     .     .     .     .
```

Remarks

The content of this table is used to calculate the contact points. The number of contact points may not exceed *nxcn* nor be less than 2. In case the number of elements equals 2, a warning is given.

The nodes of the elements must be specified in counter clockwise direction.

NDSB_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nrex	-	subcatchment number

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nrex	-10	999999	-	req	fatal

Example

```
   nnex  nrex
< I6 >< I6 >
     4     1
     7     1
     8     1
    21     2
    28     2
     .     .
     .     .
     .     .
```

Remarks

Subcatchments, located at model boundaries, must be assigned negative subcatchment numbers.

It is not necessary to define any groundwater, surface water or soil water input for any boundary node or subcatchment.

MANA_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number
7-12	I6	iosw	-	option surface water reference level for drainage and infiltration calculations
13-18	I6	ioma	-	option for weir/target in summer/winter
19-26	F8.0	lvtasm	m+MSL	summer target level (ioma = 1 or 3)
27-34	F8.0	lvtawt	m+MSL	winter target level (ioma = 3 or 4)
35-42	F8.0	lvrfsb	m+MSL	reference level of subcatchment
43-50	F8.0	dhtasu	m	depth below target level for supply
51-58	F8.0	fxsuswsb	m3/d	maximum supply surface water
59-64	I6	ndta	-	node for target level control on ground water level (ioma = 1, 3 or 4)
65-70	I6	iotasmnd	-	index target level control on summer ground water level (ioma = 1 or 3)
71-76	I6	iotawtnd	-	index target level control on winter ground water level (ioma = 3 or 4)
77-82	I6	nrta	-	subcatchment for target level control on surface water level (ioma = 1, 3 or 4)
83-88	I6	iotasmsb	-	index target level control on summer surface water level (ioma = 1 or 3)
89-94	I6	iotawtsb	-	index target level control on winter surface water level (ioma = 3 or 4)
95-100	I6	ndfrta	-	node for target level control using the root zone saturation (ioma = 1, 3 or 4)
101-106	I6	iotasmfr	-	index target level control on summer saturation (ioma = 1 or 3)
107-112	I6	iotawtfr	-	index target level control on winter saturation (ioma = 3 or 4)

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	-10	999999	-	key	fatal
iosw	0	4	-	req	fatal
ioma	1	4	-	req	fatal
lvtasm	-1.0E+02	1.0E+04	-	req	warning
lvtawt	-1.0E+02	1.0E+04	-	req	warning
lvrfsb	-1.0E+02	1.0E+04	0.0	opt	warning
dhtasu	0	10	0.0	opt	warning
fxsuswsb	0	1.0E+05	0.0	opt	warning
ndta	1	999999	-	opt	fatal
iotasmnd	0	nuta	0	req*	fatal
iotawtnd	0	nuta	0	req*	fatal
nrta	1	999999	-	opt	fatal
iotasmsb	0	nuta	0	req*	fatal
iotawtsb	0	nuta	0	req*	fatal
ndfrta	1	999999	-	opt	fatal
iotasmfr	0	nuta	0	req*	fatal
iotawtfr	0	nuta	0	req*	fatal

** required when the weir level control is specified*

Example

nrex	iosw	ioma	lvtasm	lvtawt	lvrfwr	dhtasu	fxsuswsb
< I6 ><	I6 ><	I6 ><	F8.0 ><	F8.0 ><	F8.0 ><	F8.0 ><	F8.0 >
1	0	1	1.20	1.20	9.80	0.20	0.00
2	0	1	2.00	2.00	9.20	0.00	0.00
3	0	1	2.00	2.00	8.70	0.10	0.00
4	0	1	2.00	2.00	8.60	0.50	0.00
5	0	1	2.00	2.00	9.30	0.50	0.00
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.

Remarks

Weir/target levels may be specified as time dependent data.

When because of the implementation of more control levels several target levels are calculated the lowest target level will be used.

Options

iosw

0	both drainage and infiltration relative to the soil surface in a nodal point
2	both drainage and infiltration relative to the reference level (MSL)
3	drainage relative to soil surface in a nodal point, infiltration relative to the reference level, only drainage if groundwater level is above relative surface water level
4	drainage relative to the soil surface in a nodal point, infiltration relative to the reference level (MSL). Only drainage if groundwater level is above relative surface water level. In case of extreme high water levels no “opstuwing” above shallowest conduit (usually furrows)

ioma

Ioma	Winter	Summer
1	Weirlevel	Targetlevel
2	Weirlevel	Weirlevel
3	Targetlevel	Targetlevel
4	Targetlevel	Weirlevel

GOTO_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	number water course
7-12	I6	nrgo	-	watercourse water is conducted to
13-20	F8.0	lvwrsm	m+MSL	summer weir level (ioma = 2 or 4)
21-28	F8.0	lvwrwt	m+MSL	winter weir level (ioma = 1 or 2)
29-36	F8.0	lvwrlw	m+MSL	lowest possible weir level
37-42	I6	ndwr	-	node for weir level control on ground water level (ioma = 1, 2 or 4)
43-48	I6	iowrsmnd	-	index weir level control on summer ground water level (ioma = 2 or 4)
49-54	I6	iowrwtnd	-	index weir level control on winter ground water level (ioma = 1 or 2)
55-60	I6	nrwr	-	water course for weir level control on surface water level (ioma = 1, 2 or 4)
61-66	I6	iowrsmsb	-	index weir level control on summer surface water level (ioma = 2 or 4)
67-72	I6	iowrwtsb	-	index weir level control on winter surface water level (ioma = 1 or 2)
73-78	I6	iofwbk	-	option for backflow
79-84	I6	ndfrwr	-	node for weir level control using root zone saturation (ioma = 1, 2 or 4)
85-90	I6	iowrsmfr	-	index weir level control on summer saturation (ioma = 2 or 4)
91-96	I6	iowrwtfr	-	index weir level control on winter saturation (ioma = 1 or 2)

Variable characteristics

Name	min.	max.	def.	type	error-code
nrex	-10	999999	-	key	fatal
nrgo	-10	999999	-	key	fatal
lvwrsm	-1.0E+02	1.0E+04	-	req	warning
lvwrwt	-1.0E+02	1.0E+04	-	req	warning
lvwrlw	-1.0E+02	1.0E+04	-	opt	warning
Ndwr	1	999999	-	opt	fatal
iowrsmnd	0	nuta	-	req*	fatal
iowrwtnd	0	nuta	-	req*	fatal
nrwr	1	999999	-	opt	fatal
iowrsmsb	0	nuta	-	req*	fatal
Iowrwtsb	0	nuta	-	req*	fatal
Iofwbk	-3	3	-	opt	fatal
Ndfrwr	1	999999	-	opt	fatal
iowrsmfr	0	nuta	-	req*	fatal
iowrwtfr	0	nuta	-	req*	fatal

** required when the weir level control is specified*

Example

nrex	nrgo	lvwrsm	lvwrwt	lvwrlw
< I6 ><	I6 ><	F8.0 ><	F8.0 ><	F8.0 >
1	0	1.80	1.20	2.00
2	0	1.80	1.20	2.00
3	0	1.80	1.40	2.00
4	0	1.80	1.40	2.00
5	0	1.80	1.20	2.00
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.

Remarks

There is a close relation between the input files *goto_sim.inp* and *mana_sim.inp*. For instance the parameter *ioma* is specified in *mana_sim.inp*.

A maximum of *nxgo* (i.e. 5) branches is allowed.

The lowest possible weir level may not be below the deepest drain (*dpmx*) in the subcatchment concerned.

The indexes *iowrsmnd*, *iowrwtnd*, *iowrsmsb*, *iowrwtsb*, *iowrsmfr*, *iowrwtfr* refer to the indexes in the file TACL_SIM.INP.

In the file *para_sim.inp* the default setting for *iofwbk* is specified. When in *goto_sim.inp* a value is specified, this value overrules the default settings. For example when in *para_sim.inp* the default value for *iofwbk* is set on 0 and in *goto_sim.inp* for a certain watercourse on 1, then this results in the value 1 for the specified watercourse. When in *goto_sim.inp* no value is specified the default is used.

Options

iofwbk

blank	default (from *para_sim.inp*)
-3	Mega backflow (stabilised)
-2	Strong backflow (stabilised)
-1	Common backflow (stabilised)
0	No backflow
1	Common backflow
2	Strong backflow
3	Mega backflow

In case of the strong and mega backflow option, one must realise that weirs are backward permeable!

When the subcatchment is pumped the backflow option should be set on 0.

URBN_SUB.INP (optional)

Variable format and description

col	format	name	Unit	description
1-6	I6	nrex	-	subcatchment number of sewerage reservoir
7-12	I6	nr01	-	goto waste treatment reservoir (RWZI)
13-18	I6	nr02	-	goto spillage reservoir
19-26	F8.0	srse	m3	storage capacity of sewerage reservoir
27-34	F8.0	flpocp	m3/d	Pump over capacity
35-42	F8.0	fldw	m3/d	dry weather discharge

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	-10	999999	-	key	fatal
nr01	-10	999999	-	req	fatal
nr02	-10	999999	-	req	fatal
srse	0.	1.0E+08	-	req	warning
flpocp	0.	1.0E+08	-	req	warning
fldw	0.	1.0E+08	-	req	warning

Example

```
   nrexnrgo01nrgo02    srse  flpocp    fldw
< I6 >< I6 >< I6 >< F8.0 >< F8.0 >< F8.0 >
   9000     0      0    1346    3229    38.3
   9001     0      0      63     151     0.0
   9002     0      0    4054    6880    37.5
   9003     0      0     223     536     0.0
   9004     0     24     159     476     9.0
      .     .      .       .       .       .
      .     .      .       .       .       .
      .     .      .       .       .       .
```

Remarks

The sewerage reservoir is fed with the dry weather discharge and with the inflow from the impermeable surface. This water from sewerage reservoir is pumped to the waste treatment with a maximum amount (pump over capacity). The remainder flows to the spillage reservoir.

DRNG_NOD.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nmsy	-	system index
13-20	F8.0	dpsw	m[1]	drain depth below soil surface
21-28	F8.0	wisw	m	drain width at bottom
29-36	F8.0	adsw	-	cotangent of slope
37-44	F8.0	ddsw	m	drain spacing
45-52	F8.0	lesw	m	length of drainage system
53-60	F8.0	redr	d	drainage resistance
61-68	F8.0	reen	d	entry resistance
69-76	F8.0	rein	d	infiltration resistance
77-84	F8.0	reex	d	exit resistance
85-90	I6	nrex	-	subcatchment this drainage record connects to

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	req	fatal
nmsy	0	5	-	req	fatal
dpsw	-1.0E+01	1.0E+02	-	req	warning
wisw	0.	1.0E+02	-	req	warning
adsw	0.	1.0E+02	-	req	warning
ddsw	0.1	1.0E+05	-	req1	warning
lesw	0.01	1.0E+05	-	req2	warning
redr	2.0	1.0E+04	-1.0	req	set to min/max
reen	0	1.0E+03	0.0	req	set to min/max
rein	2.0	1.0E+04	redr	req	set to min/max
reex	0	1.0E+03	Reen	req	set to min/max
nrex	-10	999999	ipndsb	opt	-

Example

```
   nnex  nmsy    dpsw    wisw    adsw    ddsw    lesw    redr    reen    rein    reex
< I6 >< I6 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >
     1     2    1.30    1.00    1.50  303.80     .    99998.0    0.00 99998.0    0.00
     1     3    1.30    1.00    1.50  520.80     .      101.0    0.00   151.5    0.00
     1     5    0.20    0.00    2.00   10.00     .       50.0    0.00    75.0    0.00
     2     2    2.00    1.00    1.50 6778.33     .    99998.0    0.00 99998.0    0.00
     2     3    2.00    1.00    1.50 9000.00     .    10000.0    0.00 15000.0    0.00
     .     .      .       .       .       .      .        .       .       .       .
     .     .      .       .       .       .      .        .       .       .       .
     .     .      .       .       .       .      .        .       .       .       .
```

[1] ss : soil surface as defined in node_sim.inp

Remarks
The system index is described in paragraph … of the User Manual.
The parameters *dpsw*, *wisw*, *adsw*, *ddsw* and *lesw* are used to calculate the storage characteristics in the surface water systems in a subcatchment.

It is permitted to specify more than one drain at the same nodal subdomain with the same system number.

If no subcatchment is specified, the default subcatchment, specified in *ndsb_sim.inp* is used.

If one of the values *ddsw* or *lesw* is missing, the missing one will be calculated:

$$lesw = \frac{A_{nod}}{ddsw} \quad \text{or} \quad ddsw = \frac{A_{nod}}{lesw}$$

with A_{nod} : nodal area (m^2).

RESV_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrrviw	-	subcatchment number of reservoir for which water is supplied (in)
7-12	I6	nrrvow	-	subcatchment number of supply reservoir (out)
13-20	F8.0	dhtarv	m	maximum depth below weir level in supply reservoir
21-28	F8.0	flmnrv	m3/d	maximal flow at subcatchment *nrsbow* for supply
29-36	F8.0	flmxrv	m3/d	maximal supply
37-42	I6	nrsbow	-	subcatchment for control

Variable characteristics

name	min.	max.	def.	type	error-code
nrrviw	-10	999999	-	key	fatal
nrrvow	-10	999999	-	key	fatal
dhtarv	0.	100	-	req	fatal
flmnrv	-	-	0	opt	-
flmxrv	-	-	0	opt	-

Example

```
  48     0    0.00   864.0  100000    68
 216   161    0.30   864.0  100000   256
 159   171    0.30     0.0  100000     0
2288   231    0.30     0.0  100000     0
 264   236    0.30   864.0  100000   445
2291   245    0.30     0.0  100000     0
2298   239    0.30     0.0  100000     0
2311   238    0.30     0.0  100000     0
2329   429    0.30     0.0  100000     0
2339   436    0.30     0.0  100000     0
2361   440    0.30     0.0  100000     0
 550   489    0.30   864.0  100000   555
 446     0    0.00   864.0  100000   237
2345   452    0.30     0.0  100000     0
2352   468    0.30     0.0  100000     0
2371   524    0.30     0.0  100000     0
2374   594    0.30     0.0  100000     0
```

Remarks

Supply to a watercourse is triggered by *dhtasu* (see *mana_sim.inp*). Water supply to a subcatchment may be defined both in *resv_sim.inp*, or/and in *mana_sim.inp*. Water supply from a reservoir (*resv_sim.inp*) has priority. It is not allowed to specify supply from more than one reservoir to a subcatchment.

dhtarv is the depth below the actual weir/target level in the supply reservoir. When the surface water level is below this depth, supply will be zero.

When the flow in subcatchment *nrsbow* exceeds the maximal flow *flmnrv* the supply will be reduced.

DISH_SIM.INP (required) and DISU_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number
7-12	F8.0	dhwr	m	energy head above weir crest
15-22	F8.0	fmwr	l/s/ha	discharge capacity of weir
23-30	F8.0	fswr	m^3/s	discharge capacity of weir
31-36	I6	nrgo	-	“goto” subcatchment

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	-10	999999	-	key	fatal
dhwr	-1.0E+01	1.0E+01	-	req	warning
fmwr	0.	1.0E+03	-	req	warning
fswr	0.	1.0E+03	-	opt	warning
nrgo	-10	999999	-	key	fatal

Example

```
   nrex     dhwr     fmwr     fswr   nrgo
< I6 >< F8.0 >< F8.0 >< F8.0 >< I6 >
     1   1.300    5.000              12
     1   1.000    4.000              12
     1   0.800    3.000              12
     1   0.600    2.000              12
     1   0.400    1.000              12
     .      .        .        .        .
     .      .        .        .        .
     .      .        .        .        .
```

Remarks
No flow is assumed at *dhwr* = 0.0 m.

It is not allowed to decrease the discharge capacity of a weir with increasing energy head above the weir crest.

If *fmwr* is specified in stead of *fswr*, the discharge capacity is calculated in m3 d-1 for the entire region upstream of the weir. When both parameters are specified *fswr* is used.

DISU_SIM.INP may be specified for summer situations.

The range of *dhwr* should cover the range of calculated heads.

TACL_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	iota	-	index for level control
7-12	F8.0	dpgwlw	m	groundwater depth below soil surface or surface water level below reference level or saturation level of the root zone
15-22	F8.0	lwta	m	lowering target/weir level

Variable characteristics

name	min.	max.	def.	type	error-code
iota	1	nuta	-	key	fatal
dpgwlw	-1.0E+01	1.0E+02	-	req	warning
lwta	-1.0E+01	1.0E+01	-	req	warning

Example

```
   iota  dpgwlw    lwta
< I6 >< F8.0 >< F8.0 >
     1    0.00    0.30
     1    0.10    0.20
     1    0.20    0.18
     1    0.30    0.15
     1    0.40    0.10
     .     .       .
     .     .       .
     .     .       .
```

Remarks

Water level control is performed in the period between *idbgwlcl* and *idedwlcl* (see *para_sim.inp*).

The target level cannot fall below the weir level.

The lowering values must be consistent with the groundwater depth: the shallower the groundwater table, the greater the associated target level lowering.

If the actual groundwater depth is lower(higher) than the lowest(highest) specified depths in this table, the lowering for the deepest(shallowest) groundwater level is used.

The lowering is **not** interpolated: in the example table given above when looking for dpgwlw = 0.33, a value lwta = 0.15 is returned.

INSW_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number
7-12	F8.0	dnsw	m	initial surface water level below reference level
15-22	F8.0	hhsw	m	initial surface water level above mean sea level

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	999999	-	key	fatal
dnsw	-1.0E+01	1.0E+02	-	req	warning
hhsw	-1.0E+02	1.0E+03	-	opt	warning

Example

```
nrex     dnsw     hhsw
< I6 >< F8.0 >< F8.0 >
     1              6.19
     2              6.19
     3              6.14
     4              6.08
     5              6.08
     .        .      .
     .        .      .
     .        .      .
```

Remarks

If this table does not exist, the initial surface water levels are set to the associated weir levels.

When both *dnsw* and *hhsw* are specified the value of hhsw is used as the initial surface water level.

When both files *insw_sim.inp* and *insw_bin.inp* are available the file *insw_bin.inp* is used as input file. The binary input file has some extra arguments.

INSW_BIN.INP (optional)

Variable format and description

col	name	unit	description
bin	nrex	-	subcatchment number
bin	dnsw	m	initial surface water level below reference level
bin	fliw	m3	surface water inflow over surface water time step
bin	flow	m3	surface water outflow over surface water time step
bin	vmpa	m3	parked volume

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	999999	-	key	fatal
dnsw	-1.0E+01	1.0E+02	-	req 1	warning
fliw	-	-	-	-	-
flow	-	-	-	-	-
vmpa	-	-	-	-	-

Example
Example is not readable.

Remarks
When both files *insw_sim.inp* and *insw_bin.inp* are available the file *insw_bin.inp* is used as input file.

COND_NOD.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nl	-	layer number
13-20	F8.2	thly	m	layer thickness
21-30	F10.6	posf	1/m	specific storativity per meter layer thickness
31-40	F10.5	cd01	m/d	hydraulic conductivity in the x'-direction of the principal conductivity axes
41-50	F10.5	cd02	m/d	hydr. conductivity in the y'-direction (aquifers) hydr. conductivity in the z-direction (aquitards)
51-58	F8.0	anxd	deg	angle between x-axis and principal direction of conductivity in the x'-direction, taken clockwise from the x'-axis to the x-axis (aquifers)

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nl	1	nxly	-	key	warning
thly	0.	1.0E+03	-	req	warning
posf	1.0E-08	1.0E-02	1.0E-05	opt	warning
cd01	1.0E-08	1.0E+08	-	req	fatal
cd02	1.0E-08	1.0E+08	cd01	opt	fatal
anxd	0.	180.00	0.0	req	fatal

Example

```
   nnex     nl     thly       posf       cd01       cd02     anxd
< I6 >< I6 >< F8.0 >< F10.6  >< F10.5  >< F10.5  >< F8.0 >
     1      1   50.00  0.000000   2.00000   2.00000      0.0
     1      2   25.00  0.000075  40.01600  40.01600      0.0
     1      3    1.50  0.000075   0.00300   0.00300      0.0
     1      4   18.75  0.000075  80.01067  80.01067      0.0
     1      5   10.00  0.000075   0.01000   0.01000      0.0
     .      .      .         .         .         .         .
     .      .      .         .         .         .         .
     .      .      .         .         .         .         .
```

Remarks

thly and *cd01/cd02* are used to calculate either the transmissivity or the vertical resistance.

The minimum value of the vertical resistance is 0.5 d, as used in the SIMGRO-calculations.

The specific storages of the toplayer and the aquifers are taken into account. The specific storages of the aquitards are not.

FAUL_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nd01	-	node number 1
7-12	I6	nd02	-	node number 2
13-18	I6	nl	-	layer number
19-26	F8.0	frcd	-	effective fraction transmissivity fault

Variable characteristics

name	min.	max.	def.	type	error-code
nd01	1	999999	-	req	fatal
nd02	1	999999	-	req	fatal
nl	1	nuly	-	req	fatal
frcd	0.	1.	-	req	fatal

Example

nd01	nd02	nl	frcd
< I6 ><	I6 ><	I6 ><	F8.0 >
11232	1122	3	0.010
3634	8881	3	0.010
4122	6733	5	0.020
451	67	5	0.100
23	125	3	0.050
.	.	.	.
.	.	.	.
.	.	.	.

Remarks

-

INHH_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nl	-	layer number
13-20	F8.0	dpin	m	initial groundwater depth below soil surface
21-28	F8.0	hhin	m+MSL	initial hydraulic head above mean sea level

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nl	1	nuly	-	key	fatal
dpin	-1.0E+01	1.0E+02	-	req	warning
hhin	-1.0E+02	1000.00	-	opt	warning

Example

```
   nnex     nl     dpin     hhin
< I6 >< I6 >< F8.0 >< F8.0 >
     1      1              6.19
     1      2              6.19
     1      3              6.14
     1      4              6.08
     1      5              6.08
     .      .      .        .
     .      .      .        .
     .      .      .        .
```

Remarks

If this table does not exist, the initial groundwater head is set to 1.0 m below soil surface, in all layers.

When both *dpin* and *hhin* are given the value *hhin* is used.

When both files *inhh_sim.inp* and *inhh_bin.inp* are available the file *inhh_bin.inp* is used as input file.

INHH_BIN.INP (optional)

Variable format and description

col	name	unit	description
bin	nnex	-	node number
bin	nl	-	number of layer
bin	hhin	m+MSL	initial hydraulic head above mean sea level
bin	cupvdt	m3	summation of fluxes over previous time step
bin	dhdt	m	change of hydraulic head over previous time step

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nl	1	nuly	-	key	fatal
hhin	-1.0E+01	1.0E+03	-	req	fatal
cupvdt	-	-	-	-	-
dhdt	-	-	-	-	-

Example
Example is not readable.

Remarks
When both files *inhh_sim.inp* and *inhh_bin.inp* are available the file *inhh_bin.inp* is used as input file.

FADE_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nmfaex	-	crop factor number
7-7	-	-	-	blank
8-23	A15	fana	-	name of crop factor

Variable characteristics

name	min.	max.	def.	type	error-code
nmfaex	1	999	-	key	fatal
fana	-	-	-	opt	fatal

Example

```
nmfaex              fana
< I6 ><>< C15          >
     1   grass
     2   maize
     3   potato
     4   open water
     5   reed
     .     .
     .     .
     .     .
```

Remarks

The names of the crop factors are used for input and output purposes only.

LUSE_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nmteex	-	number of land use type
7-7	-	-	-	blank
8-22	A15	tena	-	name of land use type
23-26	-	-	-	blank
27-32	I6	ipfa	-	pointer for evaporation factor
33-38	I6	ipagte	-	pointer for agricultural land use type
39-46	F8.0	frpric	-	interception fraction
47-52	I6	icselo	-	sensitivity to water logging
53-60	F8.0	durospte	d	duration of rotational period for sprinkling
61-66	F6.0	idspbgte	-	day number to start sprinkling
67-72	F6.0	idspedte	-	day number to end sprinkling
73-80	F8.0	frspte	-	threshold for sprinkling, rel. root zone content

Variable characteristics

Name	min.	max.	def.	type	error-code
nmteex	1	999	-	key	fatal
tena	-	-	-	opt	-
ipfa	0	999	-	key	fatal
ipagte	0	6	0	opt	warning
frpric	0	1	0	opt	set to min/max
icselo	1	nuse	3/1	opt	fatal
durospte	1	91	0.0	opt	warning
idspbgte	0	366	1.0	opt	fatal
idspedte	0	366	1.0	opt	fatal
frspte	0	0.85	0.0	opt	fatal

Example

```
nmteex        tena         ipfa  ipagte frpric icselodurospteidspbgidsped  frspte
< I6 ><><>     A15     ><  >< I6 >< I6 >< F8.0 >< I6 >< F8.0 >< I6 >< I6 >< F8.0 >
     1       GRASLAND           1     1    0.10     3             91   271    0.70
     2     FRUITTEELT           3     1    0.10     2             91   245    0.70
     3       BOUWLAND           2     1    0.10     2            120   245    0.70
     4      NAALDHOUT           0     0    0.00     3                        0.50
     5        LOOFBOS           0     0    0.00     3                        0.50
     .           .              .     .     .       .     .       .     .     .
     .           .              .     .     .       .     .       .     .     .
     .           .              .     .     .       .     .       .     .     .
```

Remarks

The land use type names are used for input-, and output purposes only.

The interception for forest land use types must be accounted for in *mete_sim.inp*.

The evapotranspiration for forest land use types is specified in *mete_sim.inp*.

The evaporation for fallow soil is accounted for in *mete_sim.inp*.

The moisture deficit fraction for sprinkling, *frspte*, can also be specified per land use type and soil physical unit in *root_sim.inp*.

For *icselo* (sensitivity for water logging) the defaults are:

ipagte = 0	icselo = 3
ipagte > 0	icselo = 1

The model assumes that for 'Urban area connected to the sewerage system' (ipagte = 5) the precipitation fallen on impermeable area, flows out of the model, unless a sewerage system is specified in *urbn_nod.inp*.

Options

ipagte

0	None of the land use types below
1	Agricultural land use
2	Surface water
3	Deciduous forest
4	Pine forest
5	Urban area connected to the sewerage system

icselo

1	Sensitive to water logging; inundated fraction evaporates as open water (e.g. sugar beets)
2	Very sensitive to water logging; inundated fraction evaporates as open water (e.g. potatoes)
3	Not sensitive to water logging; inundated fraction evaporates as open water (e.g. grass)
4	Not sensitive to water logging; inundated fraction evaporates as original vegetation (e.g. reed)

FILT_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	spunex	-	soil physical unit number
7-12	F8.0	fmmxif	mm/d	infiltration capacity

Variable characteristics

name	min.	max.	def.	type	error-code
spunex	1	99999	-	key	fatal
fmmxif	0.1	1.0E+02	1.00E+01	req	set to min/max

Example

```
spunex  fmmxif
< I6 >< F8.0 >
     1  100.00
     2  100.00
     3  100.00
     4  100.00
     5  100.00
     .      .
     .      .
     .      .
```

Remarks

-

UNSA_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	spunex	-	soil physical unit number
7-12	I6	dprzun	cm	thickness of root zone
13-20	F8.0	dpgwun	m	depth of groundwater below soil surface
21-28	F8.0	srrzdc	mm	storage of root zone for drying conditions
29-36	F8.0	srrzwc	mm	storage of root zone for wetting conditions
37-44	F8.0	fmca	mm/d	capillary rise flux
45-52	F8.0	scsa	-	storage coefficient

Variable characteristics

name	min.	max.	def.	type	error-code
spunex	1	99999	-	key	fatal
dprzun	0	-	-	req	fatal
dpgwun	-1.00E+01	1.0E+02	-	req	warning
srrzdc	0	5.0E+03	-	req	warning
srrzwc	0	5.0E+03	srrzdc	opt	warning
fmca	0	1.0E+02	-	req	warning
scsa	0	1.0E+02	-	req	warning

Example

```
spunexdprzun  dpgwun  srrzdc  srrzwc    fmca    scsa
< I6 >< I6 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >
     1     5    0.00   15.00            5.00    0.02
     1     5    0.10   12.00            5.00    0.03
     1     5    0.20   10.00            5.00    0.03
     1     5    0.30    8.00            5.00    0.04
     1     5    0.40    5.00            5.00    0.06
     .     .       .       .       .       .       .
     .     .       .       .       .       .       .
     .     .       .       .       .       .       .
```

Remarks

The data in this table is assembled using CAPSEV (Wesseling, 1991).

ROOT_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	spunex	-	soil physical unit number
7-12	I6	nmteex	-	land use type number
13-20	F8.0	dprz	m	root zone thickness
21-28	F8.0	frev01	-	relative root zone storage for h1
29-36	F8.0	frev02	-	relative root zone storage for h2
37-44	F8.0	frev03	-	relative root zone storage for h3l
45-52	F8.0	frev04	-	relative root zone storage for h3h
43-60	F8.0	frev05	-	relative root zone storage for h4
61-68	F8.0	frirbg	-	relative root zone storage start sprinkling
69-76	F8.0	frired	-	relative root zone storage end sprinkling
77-84	F8.0	frss01	-	stress fraction
85-92	F8.0	frss02	-	stress fraction

Variable characteristics

name	min.	max.	def.	type	error-code
spunex	1	99999	-	key	fatal
nmteex	1	999	-	key	fatal
dprz	0.	1.	-	req	warning
frev01	0.	1.	table	opt	fatal
frev02	0.	1.	table	opt	fatal
frev03	0.	1.	0.6	opt	fatal
frev04	0.	1.	0.2	opt	fatal
frev05	0.	1.	0.05	opt	fatal
frirbg	0.	1.	0.0	opt	fatal
frired	0.	1.	0.15	opt	fatal
frss01	0.	1.	0.	opt	warning
frss02	0.	1.	1.	opt	warning

Example

```
spunexnmteex    dprz
< I6 >< I6 >< F8.0 >
     1     1    0.25
     1     2    0.30
     1     3    0.30
     1     4    1.00
     1     5    1.00
     .     .     .
     .     .     .
     .     .     .
```

Remarks

The root zone thickness is assumed to be constant in time.
The root zone thickness is ignored for the land use type open water.
The root zone thickness is can also be specified in *area_nod.inp*, the value in *area_nod.inp* overrules the value in *root_sim.inp*.

The parameters for the unsaturated zone are derived from table *unsa_sim.inp* by linear interpolation of the root zone thickness.

The default values for *frev01* and *frev02* are specified according to the values in the table:

	icselo		
	1	2	3 or 4
frev01	1.00	0.95	1.00
frev02	0.95	0.90	1.00

FACT_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	id	-	day number
7-12	I6	nmfaex	-	crop factor number
13-20	F8.0	faev	-	crop factor
21-28	F8.0	lain	-	Leaf Area Index LAI
29-36	F8.0	vxin	mm	maximum interception of one day

Variable characteristics

name	min.	max.	def.	type	error-code
id	1	366	-	key	fatal
nmfaex	0	999	-	key	fatal
faev	0.	1.0E+01	-	req	set to min/max
lain	0.	1.0E+01	see remarks	opt	set to min/max
vxin	0.	1.0E+01	see remarks	opt	set to min/max

Example

```
     idnmfaex     faev
< I6 >< I6 >< F8.0 >
    91      1    1.00
    92      1    1.00
    93      1    1.00
    94      1    1.00
    95      1    1.00
     .      .     .
     .      .     .
     .      .     .
```

Remarks

If no crop factor is specified, bare soil evaporation is assumed.

The leaf area index, *lain*, is by default calculated as 3**faev* **2 and the maximum interception, *vxin*, is by default: 0.25e-3**lain*.

FRSW_NOD.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	F8.0	dpfrsw	m	depth below soil surface
15-22	F8.0	frsw	-	areal fraction surface water

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1.0E+00	99999	-	key	fatal
dpfrsw	-2	2	-	key	warning
frsw	0.0E+00	1.0E+00	-	req	warning

Example

```
nnex  dpfrsw    frsw
< I6 >< F8.0 >< F8.0 >
     8    0.25   0.000
     8    0.20   0.200
     8    0.15   0.300
     8    0.10   0.400
     8    0.05   0.500
     .      .      .
     .      .      .
     .      .      .
```

Remarks

The inundated fraction must be consistent with the groundwater depth: it may not decrease with shallower groundwater tables.

In order to prevent the combined storage coefficient of groundwater and surface waters to exceed *1.0*, the areal fraction of the surface water system must be compensated for in the *frsw* records. The program does not compensate this automatically.

GIFT_NOD.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	spunex	-	soil physical unit number
13-18	I6	nlab	-	layer number for abstraction
19-26	F8.0	frspgw	-	fraction of sprinkling from groundwater
27-34	F8.0	fmmxabsw	mm/d	maximum abstraction from surface water
35-42	F8.0	fmmxabgw	mm/d	maximum abstraction from groundwater
43-50	F8.0	flmxabsw	m3/d	maximum abstraction from surface water
51-58	F8.0	flmxabgw	m3/d	maximum abstraction from groundwater
59-64	I6	nnab	-	node from which groundwater is abstracted
65-70	I6	nrab	-	subcatchment from which surface water is abstracted
71-76	I6	nmmend	-	meteorological region number

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	999999	-	key	fatal
spunex	1	999999	-	key	fatal
nlab	1	nxly	-	key	fatal
frspgw	0.	1	0.0	opt	set to min/max
fmmxabsw	0.	40	0.0	opt	warning
fmmxabgw	0.	40	0.0	opt	warning
fxabsw	0.	1.0E+06	0.0	opt	warning
fxabgw	0.	1.0E+06	0.0	opt	warning
nnab	1	999999	nnex	opt	fatal
nrab	1	999999	nrex	opt	fatal
nmmend	1	999999	1	opt	fatal

Example

```
   nnex   spun   nlab   frswgwfmmxabswfmmxabgw   fxabsw   fxabgw   nnab   nrab
< I6 >< I6 >< I6 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< F8.0 >< I6 >< I6 >
      1      5      2    0.00     0.00     0.00     0.00     0.00             2
      2      1      2    0.00     0.00     0.00     0.00     0.00             2
      3      1      2    0.00     0.00     0.00     0.00     0.00             2
      4      1      2    0.00     0.00     0.00     0.00     0.00             2
      5      1      2    0.00     0.00     0.00     0.00     0.00             2
      .      .      .      .        .        .        .        .        .      .
      .      .      .      .        .        .        .        .        .      .
      .      .      .      .        .        .        .        .        .      .
```

Remarks

Sprinkling from surface water has priority, and is reduced if the supply to the region (see *mana_sim.inp*) is insufficient.

If both *fmmxabgw* and *fxabgw* are specified, the abstraction of *fxabgw* is used (so when *fmmxabgw* = 1 and *fxabgw* not specified the abstraction equals 1 mm/d and with *fxmmabgw* = 1 and *fxabgw* = 0 the abstraction will be zero). The same applies for surface water.

AREA_NOD.INP (required)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nmteex	-	number of land use type
13-20	F8.0	frarte	-	areal fraction
21-28	F8.0	dprz	M	thickness of root zone

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nmteex	1	999	-	key	fatal
frarte	0.	1.	0.0	req	set to min/max
dprz	0.	10.	0.0	opt	set to min/max

Example

```
   nnexnmteex  frarte    dprz
< I6 >< I6 >< F8.0 >< F8.0 >
     1     7    1.00    0.20
     2     4    0.50    0.40
     2     5    0.50    0.40
     3     4    0.50    0.30
     3     5    0.50    0.15
     .     .     .       .
     .     .     .       .
     .     .     .       .
```

Remarks

The sum of land use type fractions per nodal subdomain must be exactly 1.0 (this is checked in the program: the sum of fractions should be 1.0 $\pm$ 0.005).

The root zone depth can also be specified in *root_sim.inp*, where the depth depends on the combination of soil physical number and land use type number. In the file *area_nod.inp* the root zone depth can be assigned to a node number and a land use type. The value in *area_nod.inp* overrules the value for the depth in *root_sim.inp*.

URBN_NOD.INP (optional)

Variable format and description

col	format	name	Unit	description
1-6	I6	nnex	-	node number
7-12	I6	nrse01	-	sewerage or surface water system number
13-20	F8.0	frimub	-	impermeable fraction
21-28	F8.0	frimse	-	fraction impermeable surface that is sewered
29-34	I6	nrse02	-	number second sewerage system
35-42	F8.0	fxse02	m3/d	maximum discharge to second sewerage system

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nrse01	1	999999	-	key	fatal
frimub	0.	1.0	-	req	warning
frimse	0.	1.0	-	req	warning
nrse02	1	999999	-	opt	fatal
fxse02	0.	1.0E+06	-	opt	warning

Example

```
   nnexnrse01  frimub  frimse
< I6 >< I6 >< F8.0 >< F8.0 >
    11  9055    0.02    0.85
    19  9001    0.09    0.85
    20  9001    0.02    0.85
    28  9055    0.04    0.85
    29  9055    0.13    0.85
     .     .      .
     .     .      .
     .     .      .
```

Remarks

It is possible to define a second sewerage-system with a maximum discharge. The maximum discharge limits the amount of water that flows to the second sewerage system. When fxse02 equals 0 then all the water flows to the first sewage system (so the water prefers to flow to the second and the remainder flows to the first system).

ROFF_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-14	F8.0	sxsund	m	maximum storage on surface
15-22	F8.0	fxifnd	m/d	maximum infiltration capacity
23-30	F8.0	fnifnd	m/d	minimum infiltration capacity
31-38	F8.0	frifmxnd	-	storage fraction for fxifnd
39-46	F8.0	frifmnnd	-	storage fraction for fnifnd
47-54	F8.0	fxpend	m/d	maximum percolation from root zone

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
sxsund	0.	1.0E-01	1.0E-01	req	fatal
fxifnd	0.	1.0E-01	1.0E-01	req	fatal
fnifnd	0.	1.0E-01	1.0E-01	req	fatal
frifmxnd	0.	1.0E+00	1	req	fatal
frifmnnd	0.	1.	0	req	fatal
fxpend	0.	1.	1.	req	Fatal

Example

-

Remarks

If the optional file *roff_sim.inp* is missing, the runoff is simulated using the maximum infiltration capacity from *filt_sim.inp*.

INRZ_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number
7-12	I6	nmteex	-	land use type number
13-20	F8.0	vmrzdcte	m	initial moisture content of root zone

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nmteex	1	nute	-	key	fatal
vmrzdcte	0.	1000.	rem	opt	warning

Example

```
   nnexnmteexvmrzdcte
< I6 >< I6 >< F8.0 >
     1     1   112.9
     1     2   109.4
     1     3    91.5
     1     4    72.0
     1     5   211.9
     .     .      .
     .     .      .
     .     .      .
```

Remarks

When both files *inrz_sim.inp* and *inrz_bin.inp* are available the file *inrz_bin.inp* is used as input file.

If the moisture content of the root zone is not specified, equilibrium moisture content is assumed.

INRZ_BIN.INP (optional)

Variable format and description

col	name	unit	description
bin	nnex	-	node number
bin	nmteex	-	land use type number
bin	vmrzdcte	m	initial moisture content of root zone
bin	cuevac	m	sum of actual soil evaporation
bin	cuevpt	m	sum of potential soil evaporation
bin	vmsute	m	volume per unit area stored on surface

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	key	fatal
nmteex	1	nute	-	key	fatal
vmrzdcte	0.	1000.	rem	req	fatal
cuevac	0.	1.	0.	req	fatal
cuevpt	0.	1.	0.	req	fatal
vmsute	0.	1.	-	req	fatal

Example

Example is not readable.

Remarks

If the moisture content of the root zone is not specified, equilibrium moisture content is assumed.

PLHH_NOD.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number for which hydraulic heads are saved on file
7-12	I6	nl	-	layer number for which hydraulic heads are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	req	fatal
nl	1	nuly	-	req	fatal

Example

```
   nrex    nl
< I6 >< I6 >
  1589     4
  2046     4
  1279     4
  1351     4
  1359     2
     .     .
     .     .
     .     .
```

Remarks

In the file *hhgw_nod.out* the hydraulic heads are saved for each combination of node number and layer number (as specified in *plhh_nod.inp).*

In the binary output file *hh.out* the hydraulic heads are saved for each combination of node number (as specified in *plhh_nod.inp)* and layer number (as specified in *plhh_lay.inp).*

PLHH_LAY.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nl	-	layer number for which hydraulic heads are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nl	1	nuly	-	req	fatal

Example

```
    nl
< I6 >
     1
     2
     3
     4
     5
     .
     .
     .
```

Remarks

-

PLHH_SUB.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number for which hydraulic heads are saved on file
7-12	I6	nl	-	layer number for which hydraulic heads are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	999999	-	req	fatal
nl	1	nuly	-	req	fatal

Example

```
   nrex     nl
< I6 >< I6 >
  1589      4
  2046      4
  1279      4
  1351      4
  1359      2
     .      .
     .      .
     .      .
```

Remarks

-

PLWB_NOD.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number for which water balance data are saved on file
7-12	I6	ly	-	layer number

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	req	fatal
ly	1	nuly	-	req	fatal

Example

```
   nnex    ly
< I6 >< I6 >
  1589     4
  2046     4
  1279     4
  1351     4
  1359     2
     .     .
     .     .
     .     .
```

Remarks

See also at the ‘parameters for output options’ in *para_sim.inp.*
Only the non border nodes should be specified.

PLWB_LAY.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	layer number for which water balance data are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nl	1	nuly	-	req	fatal

Example

```
    nl
< I6 >
     1
     2
     3
     4
     5
     .
     .
     .
```

Remarks

See also at the ‘parameters for output options’ in *para_sim.inp.*

PLWB_SUB.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number for which water balance data is saved on file
7-12	I6	nl	-	layer number for which water balance data is saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	99999	-	req	fatal
nl	1	nuly	-	req	fatal

Example

```
     1     1
     2     1
     3     1
     4     1
     5     1
     6     1
     7     1
     8     1
     9     1
    10     1
    11     1
    12     1
    13     1
    14     1
    15     1
    16     1
    17     1
    18     1
    19     1
    20     1
    21     1
    22     1
    23     1
    24     1
    25     1
    26     1
    27     1
    28     1
    29     1
```

Remarks

See also at the ‘parameters for output options’ in *para_sim.inp.*

NDBD_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number for which boundary data are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	req	fatal

Example

```
   nnex
< I6 >
  1589
  2046
  1279
  1351
  1359
     .
     .
     .
```

Remarks

Groundwater heads are written to file *tibd_sim.out* every time in file *tiop_sim.inp* code io = 9 is specified. The specified nodes should not be boundary nodes.

NDLK_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nnex	-	node number for which bottom boundary conditions (leakage fluxes) are saved on file
7-12	I6	ly	-	layer number

Variable characteristics

name	min.	max.	def.	type	error-code
nnex	1	999999	-	req	fatal
ly	1	nuly	-	req	fatal

Example

```
   nnex    ly
< I6 >< I6 >
  1589     4
  2046     4
  1279     4
  1351     4
  1359     2
     .     .
     .     .
     .     .
```

Remarks

Bottom boundary fluxes are written to file *tibd_sim.out* every time in file *tiop_sim.inp* code io = 9 is specified. The specified nodes should not be boundary nodes.

NRBD_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	I6	nrex	-	subcatchment number for which boundary conditions (incoming fluxes) are saved on file

Variable characteristics

name	min.	max.	def.	type	error-code
nrex	1	999999	-	req	fatal

Example

```
   nrex
< I6 >
    89
    46
    79
   351
   359
     .
     .
     .
```

Remarks

Output is written to file *tisw_sim.out* every *dtpt*.

METE_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	F6.2	id	-	day number
7-12	I6	iy	-	year number
13-22	F10.2	pr	mm	precipitation
23-32	F10.2	evgr	mm	potential reference evapotranspiration
33-42	F10.2	evpf	mm	potential evapotranspiration of pine forest
43-52	F10.2	evdf	mm	potential evapotranspiration of deciduous forest
53-62	F10.2	faevba	-	evaporation factor of bare soil
63-68	I6	nmme	-	meteorological region number

Variable characteristics

name	min.	max.	def.	type	error-code
id	0	366	-	key	fatal
iy	0	9999	-	key	fatal
pr	0	1.0E+03	-	req	warning
evgr	0	1.0E+01	-	req	warning
evpf	0	1.0E+01	-	req	warning
evdf	0	1.0E+01	-	req	warning
faevba	0	1.0	-	req	set to min/max
nmme	1	99999	1	opt	Fatal

Example

```
    id     iy        pr       evgr       evpf       evdf     faevba
<F6.2><  I6>< F10.2  >< F10.2  >< F10.2  >< F10.2  >< F10.2  >
  1.00  1991      2.80       0.42       1.71       0.49       1.00
  2.00  1991     20.40       0.08       1.57       0.18       1.00
  3.00  1991      2.00       0.22       1.70       0.32       1.00
  4.00  1991      0.40       0.36       0.73       0.44       1.00
  5.00  1991      3.70       0.09       1.63       0.20       1.00
    .     .         .          .          .          .          .
    .     .         .          .          .          .          .
    .     .         .          .          .          .          .
```

Remarks

This file is assembled from standard meteorological data like precipitation (mm/d), average temperature (^{o}C), global radiation (W/m2) and relative humidity (-).

Meteorological data should be specified from the time to begin the calculations until the time to end the calculations. The time step can also be smaller than 1 day. The data in this file should be in chronological order

TIBD_SIM.INP (optional)

Variable format and description

col	format	name	unit	Description
1-6	F6.1	id	-	day number
7-12	I6	iy	-	year number
13-18	I6	nnex	-	node number
19-24	I6	nl	-	layer number
25-30	I6	iolv	-	option code for level reference
31-40	F10.0	hhgwnw	see iolv	new groundwater level
41-50	F10.0	flgwnw	m3/d	boundary flux

Variable characteristics

name	min.	max.	def.	type	error-code
id	0	366	-	req	fatal
iy	1	9999	-	req	fatal
nnex	1	999999	-	req	fatal
nl	1	nuly	-	req	fatal
iolv	0	2	0	opt	fatal
hhgwnw	-1.0E+05	1.0E+05	-	opt 1	warning
flgwnw	-1.0E+05	1.0E+05	-	opt 2	warning

Example

```
      id    iy   nnex    nl  iolv    hhgwnw    flgwnw
< F6.>< I6 >< I6 >< I6 >< I6 >< F10.0  >< F10.0  >
  1.00  1985     1     4     2     13.58
  1.00  1985     3     4           12.00    500.00
  1.00  1985     6     4                   -554.00
  1.00  1985    10     4                   -554.00
  1.00  1985    15     4                   -554.00
     .     .     .     .     .     .          .
     .     .     .     .     .     .          .
     .     .     .     .     .     .          .
```

Remarks

Recharge is defined positive (**in** is positive, **out** is negative).
This input file is meant for specification of boundary conditions in boundary nodes.

Options

iolv

0	levels specified as depth below soil surface
2	levels specified relative to mean sea level

TIAB_SIM.INP (optional)

Variable format and description

Col	format	name	unit	description
1-6	F6.1	id	-	day number
7-12	I6	iy	-	year number
13-18	I6	nnex	-	node number
19-24	I6	nl	-	layer number
25-30	I6	iolv	-	option code for level reference
31-40	F10.0	hhgwnw	see iolv	new groundwater level
41-50	F10.0	flgwnw	m3/d	new abstraction flux

Variable characteristics

Name	min.	max.	def.	type	error-code
id	0	366	-	req	fatal
iy	1	9999	-	req	fatal
nnex	1	999999	-	req	fatal
nl	1	nuly	-	req	fatal
iolv	0	2	0	opt	fatal
hhgwnw	-1.00E+05	1.00E+05	-	opt 1	warning
flgwnw	-1.00E+05	1.00E+05	-	opt 2	warning

Example

```
    id    iy   nnex    nl  iolv    hhgwnw    flgwnw
< F6.>< I6 >< I6 >< I6 >< I6 >< F10.0  >< F10.0  >
  1.00  1985  1711     2                   -1444.00
  1.00  1985  1702     4                  -11306.00
  1.00  1985  1304     4                    -2709.00
  1.00  1985  1223     4                    -2621.00
  1.00  1985  1125     2                    -4742.00
     .     .     .     .     .     .          .
     .     .     .     .     .     .          .
     .     .     .     .     .     .          .
```

Remarks

Deep well recharge is defined with a positive flgwnw (**in** is positive, **out** is negative).

This input file is meant for specification of boundary conditions in internal nodes.

When both hhgwnw and flgwnw are specified hhgwnw (=opt1) has priority.

Options

iolv

0	levels specified as depth below soil surface
>0	levels specified relative to mean sea level

TIOP_SIM.INP (required)

Variable format and description

col	format	name	unit	description
1-6	F6.1	id	-	day number
7-12	I6	iy	-	year number
13-18				blank
19-24	I6	nl	-	layer number
25-30	I6	io	-	option number
31-40	F10.0	dtgwnw	d	groundwater time step

Variable characteristics

name	min.	max.	def.	type	error-code
id	0	366	-	req	fatal
iy	1	9999	-	req	fatal
nl	1	nuly	-	opt	fatal
io	6	12	-	req	fatal
dtgwnw	1.0E-02	1.0E+02	-	opt	fatal

Example

```
     id     iy          nl     io     dtgwnw
< F6.>< I6 ><    >< I6 >< I6 ><    F10.0>
  1.20  1985                 6       0.20
  5.00  1985                 6       1.00
 10.00  1985                 6       2.00
 91.00  1989           2     8
 91.00  1989                 7
     .     .           .     .        .
     .     .           .     .        .
     .     .           .     .        .
```

Remarks

-

Options

io	nl	dtgwnw	description
6	-	+	new time step
7	-	-	save results for periodical water balance
8	+	-	save results of flow direction in aquifer
9	-	-	save results for inzoom model

- = not to be specified; + = to be specified

TISW_SIM.INP (optional)

Variable format and description

col	format	name	unit	description
1-6	F6.0	id	-	day number
7-12	I6	iy	-	year number
13-18	I6	nrex	-	subcatchment number
19-24				blank
25-30	I6	iolv	-	option code for level reference
31-40	F10.0	hhswnw	see iolv	new surface water level
41-50	F10.0	hhwrnw	see iolv	new weir/target level
51-60	F10.0	flswnw	m3/d	new surface water inflow rate

Variable characteristics

name	min.	max.	def.	type	error-code
id	0	366	-	req	fatal
iy	1	9999	-	req	fatal
nrex	1	999999	-	req	fatal
iolv	0	2	0	opt	fatal
hhswnw	-1.00E+05	1.00E+05	-	opt 1	warning
hhwrnw	-1.00E+03	1.00E+03	-	opt 2	warning
flswnw	0.00E+00	1.00E+08	-	opt 3	warning

Example

```
     id     iy        nnex     nl   iolv     hhgwnw     flgwnw
< F6.>< I6 ><    >< I6 >< I6 >< I6 ><  F10.0 >< F10.0  >
  1.00  1985           1      4      2      13.58
  1.00  1985           3      4                        554.00
  1.00  1985           6      4                        554.00
  1.00  1985          10      4                        554.00
  1.00  1985          15      4                        554.00
     .     .           .      .      .      .           .
     .     .           .      .      .      .           .
     .     .           .      .      .      .           .
```

Remarks

The definition of a new surface water level ‘hhswnw’ is **not** functioning at the moment.

If a new weir/target level is introduced in the time-records, both the summer and the winter weir/target levels are updated at the specified time, implying that the weir/target level of the specified subcatchment is to be controlled fully in this file.

Options

iolv

0	levels specified as depth below reference level (see mana_sim.inp)
2	levels specified relative to mean sea level

Appendix 2 Binary outputfiles

General

The heads, surface water levels and flow terms are written to binary output files. To extract information from these binary outputfiles two help files have to be used. So each binary output consists of three files:

- the key information is written to .key-files: ;
- the timer information to .tim-files (both in ascii);
- the actual output is written to .out-files, using a binary 'format'.

The keyfiles describe the structure of the binary outputfiles and they also describe the items of the binary outputfiles. The number of items can vary for one and the same key-files depending on the options set in the file *para_sim.inp*. For a description see paragraph Appendix 1 . For instance the option *ioptgw =2* specifies that only surface water depths are written to the output-file and *ioptgw=3* specifies that both surface water and groundwater depths are written.

In this Appendix the following aspects are described:

- Structure
- Contents of the key-files
- Reading the binary output files

Structure

The key file (ascii)

In the key-file the out-file is completely outlined. This is done by specifying the following parameters:

- OUTPUTFILE : name of OUT-file
- TIMERFILE : name of TIM-file
- FILETYPE : NOD for nodes or SUB for subcatchments
- FORMAT : R4 for Real*4 or I2 for Integer*2
- NUMPTS : number of nodes/subcatchments
- NUMLAY : number of layers,
- list of records:
  - numpts-id, layer number, ground level, bottom layer (for the layerfiles), area and accumulated area (subcatchments only)
- RECLEN : record length
- NUMLINVAR : number of lines for variables (either 1 or NUMVAR)
- NUMVAR : number of variables,
- list of variables:
  - name of the variable, unit, description

- PERIOD : period (1) or point in time (0) indicator

The tim-file (ascii)
In the tim-file the data of the output periods are specified, on each line the year and the day number are specified.

The out-file (binary)
The output can be stored in 2 possible ways:
- in case NUMLINVAR = 1, a record contains output for all output variables (NUMVAR). The order of records is:
  - time step or period (NUMTIM)
  - layer (NUMLAY)
  - node or subcatchment (NUMPTS)
- In case NUMLINVAR = NUMVAR, a record contains output for all nodes or subcatchments (NUMPTS). The order of records is:
  - time step or period (NUMTIM)
  - layer (NUMLAY)
  - variable (NUMVAR)

The out-files are unformatted, but not direct-access.

Examples

Example of key file dbndpsim.key:

```
*
* Key file output SIMGRO V4.0
OUTPUTFILE = dbndpsim.out
TIMERFILE  = dbpsim.tim
FILETYPE   = NOD
FORMAT     = R4
NUMPTS     =       8
NUMLAY     =       1
  8464  1   26.73   25.12       19833       19833
  8314  1   26.75   25.20       13568       13568
  8315  1   27.01   26.23       30579       30579
  8313  1   26.60   25.72       30147       30147
  8152  1   27.64   26.61       38374       38374
  8317  1   27.89   25.46       21779       21779
  8751  1   27.89   25.47        2282        2282
  8616  1   27.86   25.44        4092        4092
RECLEN     =     21
NUMLINVAR  =      1
NUMVAR     =     21
iosw                -         surface water calculation option
hhsw                m+MSL     surface water level
hhswnt              m+MSL     net surface water level
hhwr                m+MSL     weir level
hhwrnt              m+MSL     net weir level
srrz                m3        storage in root zone
srun                m3        storage in unsaturated zone
flevpt              m3        potential evapotranspiration
flpr                m3        precipitation
flin                m3        interception
flev                m3        evapotranspiration
flru                m3        runoff
flro                m3        runon
flse                m3        flow to sewerage
flirsw              m3        irrigation from surface water
flirgw              m3        irrigation from groundwater
flirev              m3        evaporated irrigation water
flirpe              m3        percolated irrigation water
flsrrz              m3        root zone storage decrease
fliwlkrz            m3        leakage to root zone (prec.lens)
srpr                m3        precipitation storage in lens
PERIOD     = 1
```

Remarks

The item *fliwlkrz* is the gross flux to the root zone. It represents the total capillary flux to the root zone, this flux is very important for ecological effect predictions.

Example of tim file dbpsim.tim:

```
  0.00  1982
 90.00  1982
182.00  1982
273.00  1982
  0.00  1983
 90.00  1983
182.00  1983
273.00  1983
```

Contents of the key-files

In this paragraph the items of the key-files are described. The optional items are written in italic.
The name of the executable for reading a keyfile is also given.
Furthermore the conversion of the units of the binary file to the text file is also specified.

hh.key/hh.out/hh.tim

hh.key	unit in out-file	item	remarks
hh	m+MSL	hydraulic head	at the end of the period

For each combination of nodes (plhh_nod.inp) and layer (plhh_lay.inp) the heads are written to the output file (daily).

gt.key/gt.out/gt.tim

gt.key	unit in out-file	item	remarks
hhti(nd,1)	m+MSL	phreatic level	at the end of the period
hhsw	m+MSL	surface water level	at the end of the period
hhti(nd,2)	m+MSL	groundwater level first aquifer	at the end of the period

The items are written to the output file for layer 1 for each node (bimonthly).

gw.key/gw.out/gw.tim

gw.key	unit in out-file	Item	remarks
dpgw	*cm*	*groundwater depth*	*at the end of the period*
dpsw	*cm*	*surface water depth*	*at the end of the period*

The items are written to the output file for all the nodes of layer 1 (daily).

sw.key/sw.out/sw.tim

sw.key	unit in out-file	item	remarks
flowsw	m3/d	surface water outflow	mean over the period
lvsw	*m+MSL*	*surface water level*	*at the end of the period*

The items are written to the output file for all subcatchments (daily).

dbndpsim

dbndpsim.key/ dbnddsim.key	unit in out-file	item	Remarks
iosw	-	surface water calculation option	-
hhsw	m+MSL	surface water level	at the end of the period
hhswnt[1]	m+MSL	net surface water level	at the end of the period
hhwr	m+MSL	weir level	at the end of the period
hhwrnt[2]	m+MSL	net weir level	at the end of the period
srrz	m3	storage in root zone	at the end of the period
srun	m3	storage in unsaturated zone	at the end of the period
flevpt	m3	potential evapotranspiration	cum. over the period
flpr	m3	precipitation	cum. over the period
flin	m3	interception	cum. over the period
flev	m3	evapotranspiration	cum. over the period
flru	m3	runoff	cum. over the period
flro	m3	runon	cum. over the period
flse	m3	flow to sewerage	cum. over the period
flirsw	m3	irrigation from surface water	cum. over the period
flirgw	m3	irrigation from groundwater	cum. over the period
flirev	m3	evaporated irrigation water	cum. over the period
flirpe	m3	percolated irrigation water	cum. over the period
flsrrz	m3	root zone storage decrease	cum. over the period
fliwlkrz	m3	leakage to root zone (prec.lens)[3]	cum. over the period
srpr	m3	precipitation storage in lens	at the end of the period

[1] The *net surface water level* is the maximum of the surface water level in the subcatchment the node is part of and the deepest conduit in the node.

[2] The *netweir level* is the maximum of the weir level in the subcatchment the node is part of and the deepest conduit in the node.

[3] The gross leakage to the root zone, so the sum of all the leakage fluxes in the period or the day.

dbnddsim

dbndpsim.key/ dbnddsim.key	unit in out-file	item	Remarks
iosw	-	surface water calculation option	-
hhsw	m+MSL	surface water level	at the end of the period
hhswnt[1]	m+MSL	net surface water level	at the end of the period
hhwr	m+MSL	weir level	at the end of the period
hhwrnt[2]	m+MSL	net weir level	at the end of the period
srrz	m3	storage in root zone	at the end of the period
srun	m3	storage in unsaturated zone	at the end of the period
flevpt	m3/d	potential evapotranspiration	mean over the period
flpr	m3/d	precipitation	mean over the period
flin	m3/d	interception	mean over the period
flev	m3/d	evapotranspiration	mean over the period
flru	m3/d	runoff	mean over the period
flro	m3/d	runon	mean over the period
flse	m3/d	flow to sewerage	mean over the period
flirsw	m3/d	irrigation from surface water	mean over the period
flirgw	m3/d	irrigation from groundwater	mean over the period
flirev	m3/d	evaporated irrigation water	mean over the period
flirpe	m3/d	percolated irrigation water	mean over the period
flsrrz	m3/d	root zone storage decrease	mean over the period
fliwlkrz	m3/d	leakage to root zone (prec.lens)[3]	mean over the period
srpr	m3	precipitation storage in lens	at the end of the period

The items are written to the output file for all the nodes per period (dbndpsim) or per day (dbnddsim).

[1] The *net surface water level* is the maximum of the surface water level in the subcatchment the node is part of and the deepest conduit in the node.

[2] The *netweir level* is the maximum of the weir level in the subcatchment the node is part of and the deepest conduit in the node.

[3] The gross leakage to the root zone, so the sum of all the leakage fluxes in the period or the day.

dbsbpsim

dbsbpsim.key/ dbsbdsim.key	unit in out-file	item	Remarks
ioma	-	option for weir management	-
hhwr	m+MSL	weir level	at the end of the period
hhta	m+MSL	target level	at the end of the period
hhsw	m+MSL	surface water level	at the end of the period
srsw	m3	storage in surface water	at the end of the period
srse	m3	storage in sewerage system	at the end of the period
flsrsw	m3	decrease of surface water storage	cum. over the period
flsrse	m3	decrease of sewerage storage	cum. over the period
fliw	m3	surface water inflow	cum. over the period
flow	m3	surface water outflow	cum. over the period
fliwse	m3	not used	cum. over the period
fliwsi	m3	not used	cum. over the period
fldrsy1	m3	drainage to 1st system	cum. over the period
flifsy1	m3	subinfiltration from 1st system	cum. over the period
fldrsy2	m3	drainage to 2rd system	cum. over the period
flifsy2	m3	subinfiltration from 2nd system	cum. over the period
fldrsy3	m3	drainage to 3rd system	cum. over the period
flifsy3	m3	subinfiltration from 3rd system	cum. over the period
fldrsy4	m3	drainage to 4th system	cum. over the period
flifsy4	m3	subinfiltration from 4th system	cum. over the period
fldrsy5	m3	drainage to 5th system	cum. over the period
flifsy5	m3	subinfiltration from 5th system	cum. over the period
fliwrv	m3	supply from reservoir	cum. over the period
flowrv	m3	abstraction from reservoir	cum. over the period
fliwgw	m3	not used	cum. over the period
flowgw	m3	not used	cum. over the period
fliwsu	m3	inflow from surface water supply	cum. over the period
flowsu	m3	not used	cum. over the period
fliwbdsw	m3	inflow from outside model	cum. over the period
flowsp	m3	abstraction for sprinkling	cum. over the period

dbsbdsim

dbsbpsim.key/ dbsbdsim.key	unit in out-file	item	Remarks
ioma	-	option for weir management	-
hhwr	m+MSL	weir level	at the end of the period
hhta	m+MSL	target level	at the end of the period
hhsw	m+MSL	surface water level	at the end of the period
srsw	m3	storage in surface water	at the end of the period
srse	m3	storage in sewerage system	at the end of the period
flsrsw	m3/d	decrease of surface water storage	mean over the period
flsrse	m3/d	decrease of sewerage storage	mean over the period
fliw	m3/d	surface water inflow	mean over the period
flow	m3/d	surface water outflow	mean over the period
fliwse	m3/d	not used	mean over the period
fliwsi	m3/d	not used	mean over the period
fldrsy1	m3/d	drainage to 1st system	mean over the period
flifsy1	m3/d	subinfiltration from 1st system	mean over the period
fldrsy2	m3/d	drainage to 2rd system	mean over the period
flifsy2	m3/d	subinfiltration from 2nd system	mean over the period
fldrsy3	m3/d	drainage to 3rd system	mean over the period
flifsy3	m3/d	subinfiltration from 3rd system	mean over the period
fldrsy4	m3/d	drainage to 4th system	mean over the period
flifsy4	m3/d	subinfiltration from 4th system	mean over the period
fldrsy5	m3/d	drainage to 5th system	mean over the period
flifsy5	m3/d	subinfiltration from 5th system	mean over the period
fliwrv	m3/d	supply from reservoir	mean over the period
flowrv	m3/d	abstraction from reservoir	mean over the period
fliwgw	m3/d	not used	mean over the period
flowgw	m3/d	not used	mean over the period
fliwsu	m3/d	inflow from surface water supply	mean over the period
flowsu	m3/d	not used	mean over the period
fliwbdsw	m3/d	inflow from outside model	mean over the period
flowsp	m3/d	abstraction for sprinkling	mean over the period

The items are written to the output file for all the subcatchments per period (dbndpsim) or per day (dbnddsim).

dblypsim

dblypsim.key/ dblydsim.key	unit in out-file	item	remarks
hhgw	m+MSL	groundwater level	at the end of the period
flsr	m3	storage loss	cum. over the period
fliwlk	m3	vertical inflow	cum. over the period
flowlk	m3	vertical outflow	cum. over the period
flifsyly1	m3	subinfiltration from 1st system	cum. over the period
fldrsyly1	m3	drainage to 1st system	cum. over the period
flifsyly2	m3	subinfiltration from 2nd system	cum. over the period
fldrsyly2	m3	drainage to 2nd system	cum. over the period
flifsyly3	m3	subinfiltration from 3rd system	cum. over the period
fldrsyly3	m3	drainage to 3rd system	cum. over the period
flifsyly4	m3	subinfiltration from 4th system	cum. over the period
fldrsyly4	m3	drainage to 4th system	cum. over the period
flifsyly5	m3	subinfiltration from 5th system	cum. over the period
fldrsyly5	m3	drainage to 5th system	cum. over the period
fliwla	m3	lateral inflow	cum. over the period
flowla	m3	lateral outflow	cum. over the period
flrc	m3	recharge	cum. over the period
flspgw	m3	abstraction for sprinkling	cum. over the period
flabrv	m3	abstraction from reservoir	cum. over the period

dblydsim

dblypsim.key/ dblydsim.key	unit in out-file	item	remarks
hhgw	m+MSL	groundwater level	at the end of the period
flsr	m3/d	storage loss	mean over the period
fliwlk	m3/d	vertical inflow	mean over the period
flowlk	m3/d	vertical outflow	mean over the period
flifsyly1	m3/d	subinfiltration from 1st system	mean over the period
fldrsyly1	m3/d	drainage to 1st system	mean over the period
flifsyly2	m3/d	subinfiltration from 2nd system	mean over the period
fldrsyly2	m3/d	drainage to 2nd system	mean over the period
flifsyly3	m3/d	subinfiltration from 3rd system	mean over the period
fldrsyly3	m3/d	drainage to 3rd system	mean over the period
flifsyly4	m3/d	subinfiltration from 4th system	mean over the period
fldrsyly4	m3/d	drainage to 4th system	mean over the period
flifsyly5	m3/d	subinfiltration from 5th system	mean over the period
fldrsyly5	m3/d	drainage to 5th system	mean over the period
fliwla	m3/d	lateral inflow	mean over the period
flowla	m3/d	lateral outflow	mean over the period
flrc	m3/d	recharge	mean over the period
flspgw	m3/d	abstraction for sprinkling	mean over the period
flabrv	m3/d	abstraction from reservoir	mean over the period

Remarks on the items:

- Fliwlk/flowlk :
  The vertical inflow and outflow fluxes are net fluxes over the period.
  So either fliwlk or flowlk has a value.

The vertical inflow and outflow fluxes are specified for the top of the layer. To get the vertical fluxes at the bottom of the layer one should ask for the vertical fluxes of the layer beyond.

The items are written to the output file for all the nodes and all the layers per period (dblypsim) or per day (dblydsim).

du.key

du.key	unit in out-file	item	remarks
fldu	m3/d	duflow boundary flow	mean over the period

The items are written to the output file for all subcatchments on daily base.

Appendix 3 Ascii outputfiles

General ASCII-outputfiles

inpt_sim.out
After reading the model input and the initialisation procedures, the model is ready to run. Prior to beginning calculations, model input is written to inpt_sim.out. This file is self-explaining.

info_sim.out
All informative messages, warnings and error messages are written to info_sim.out, except for runtime errors, which are written to the log file.
Informative messages and warnings can be suppressed (see parameter ioptms).
All messages are listed in paragraph ….. .

iter_sim.out
Iteration results are written to iter_sim.out. For each iteration, the following information is printed:

Variable format and description

col	format	name	unit	description
1-6	F6.2	idac	-	day number
7-12	I6	iyac	-	year
13-18	I6	nmit	-	iteration number
19-25	I7	ndmax	-	node number
26-32	I7	lymax	-	layer number
33-43	F11.6	dhmxitd	m	maximum difference in head during iteration (all layers)
44-49	I6	ndmax1		node number (layer1)
50-59	F10.6	dhmxit		maximum difference in head during iteration (layer 1)
60-67	F12.8	farx	-	overrelaxation factor

At the end of each groundwater time step, the flow balance error per layer is printed as well as the maximum change in head of a node.

Top layer outputfiles

Water balances (wbal****.out)

The description of this file is representative for all wbal****.out-files. It includes the complete water balance of the first layer.

Variable format and description

col	format	name	unit	description
1-6	F6.2	dy	-	day
7-11	I5	yr	-	year
12-17	I6	nm	-	node/subcatchment/layer
18-20	I3	nl	-	layer
21-26	F6.1	dt	d	time step
27-36	F10.0	ar	m2	area
37-46	F10.2	fam3	d m2	conv. factor from 0.01 mm d-1 to m3
47-53	F7.2	gl	m	soil surface
54-60	F7.2	hhgw	m	groundwater level
61-67	F7.2	hhsw	m	surface water level
68-74	F7.2	hhwr	m	weir/target level
75-84	F10.0	srsw	0.01 mm	storage in surface water
85-94	F10.0	srrz	0.01 mm	storage in root zone
95-104	F10.0	flpr	0.01 mm d-1	precipitation
105-114	F10.0	flin	0.01 mm d-1	interception
115-124	F10.0	flse	0.01 mm d-1	flow to sewage
125-134	F10.0	flirpe	0.01 mm d-1	net irrigation
135-144	F10.0	flev	0.01 mm d-1	evaporation
145-154	F10.0	fllk	0.01 mm d-1	leakage
155-164	F10.0	flla	0.01 mm d-1	lateral flow
165-174	F10.0	fliwbdsw	0.01 mm d-1	total surface water inflow
175-184	F10.0	flownt	0.01 mm d-1	total surface water outflow
185-194	F10.0	flsu	0.01 mm d-1	supply
195-204	F10.0	flrv	0.01 mm d-1	abstraction for supply
205-214	F10.0	fldrtr	0.01 mm d-1	drainage loss
215-224	F10.0	flab	0.01 mm d-1	groundwater abstraction
225-234	F10.0	flsr	0.01 mm d-1	decrease in storage
235-244	F10.0	flsrrz	0.01 mm d-1	decrease in root zone storage
245-254	F10.0	flsrsw	0.01 mm d-1	decrease in surface water storage
255-264	F10.0	fler	0.01 mm d-1	water balance error

Groundwater module output files

Flux density (flho_sim.out)
The horizontal flux density of each contact point and node is written to this file at point in time specified in tiop_sim.inp.

Groundwater levels (hhgw_*.out)**
Groundwater levels per groundwater time step. Code *** is either:
- "nod" for nodes (nodes per layer specified in plhh_nod.inp)
- "lay" for layer.

These files are self-explaining.

Groundwater levels 2-monthly (hhgw_tno.out)
Groundwater levels are usually measured around the 14th and 28th of each month only. At those points of time all groundwater levels are written to this file. The exact day numbers are: 14, 28, 45, 59, 73, 87, 104, 118, 134, 148, 165, 179, 195, 209, 226, 240, 257, 271, 287, 301, 318, 332, 348 and 362.

Variable format and description

col	format	name	unit	description
1-6	F6.2	idac	-	day number
7-12	I6	iyac	-	year
13-18	I6	nd	-	node number
19-26	F8.2	hhgw(nd,1)	m	groundwater level layer 1
27-34	F8.2	hhgw(nd,2)	m	groundwater level layer 2
etc	..	..	..	..

Groundwater levels at the end (inhh_sim.out)
At the end of the SIMGRO calculations, the final groundwater heads, surface water levels and root zone contents are written to output files. These files may be used as input for a subsequent SIMGRO run. It suffices to rename the ".out" versions to ".inp" versions

A full description is given for inhh_sim.inp.

Water balances (wbsa**.out)**

The description of this file is representative for all wbsa****.out files. It concerns the complete water balance of the saturated zone.

Variable format and description

col	format	name	unit	description
1-6	F6.2	dy	-	day
7-11	I5	yr	-	year
12-17	I6	nm	-	node/subcatchment/layer
18-20	I3	nl	-	layer
21-26	F6.1	dt	d	time step
27-36	F10.0	ar	m^2	area
37-46	F10.2	fam3	d m^2	conv. factor from 0.01 mm d-1 to m3
47-53	F7.2	gl	m	soil surface
54-60	F7.2	hhgw	m	groundwater level
61-67	F7.2	hhsw	m	surface water level
68-74	F7.2	hhwr	m	weir/target level
75-84	F10.0	srsw	0.01 mm	storage in surface water
85-94	F10.0	srrz	0.01 mm	storage in root zone
95-104	F10.0	flpe	0.01 mm d-1	percolation
105-114	F10.0	fldr01	0.01 mm d-1	drainage flux to 1st system
115-124	F10.0	fldr02	0.01 mm d-1	drainage flux to 2nd system
125-134	F10.0	fldr03	0.01 mm d-1	drainage flux to 3rd system
135-144	F10.0	fldr04	0.01 mm d-1	drainage flux to 4th system
145-154	F10.0	fldr05	0.01 mm d-1	drainage flux to 5th system
155-164	F10.0	fldrtr	0.01 mm d-1	drainage loss
165-174	F10.0	fllk	0.01 mm d-1	leakage
175-184	F10.0	flla	0.01 mm d-1	lateral flow
185-194	F10.0	flspgw	0.01 mm d-1	sprinkling from groundwater
195-204	F10.0	flrc	0.01 mm d-1	abstraction from groundwater (excl. sprinkling)
205-214	F10.0	flsr	0.01 mm d-1	decrease in storage
215-224	F10.0	fler	0.01 mm d-1	water balance error

Surface water module output files

Surface water levels (hhsw_*.out)**
Surface water levels per groundwater time step. Code *** is either:
- "nod" for nodes or
- "sub" for subcatchments or
- "lay" for layer.

These files are self-explaining.

Surface water levels at the end (insw_sim.out)
At the end of the SIMGRO calculations, the final groundwater heads, surface water levels and root zone contents are written to output files. These files may be used as input for a subsequent SIMGRO run. It suffices to rename the ".out" versions to ".inp" versions
A full description is given for insw_sim.inp.

Water balances (wbsw**.out)**
The description of this file is representative for all wbsw****.out files. It concerns the complete water balance of the surface water system.

Variable format and description

col	format	name	unit	description
1-6	F6.2	dy	-	day
7-11	I5	yr	-	year
12-17	I6	nm	-	node/subcatchment/layer
18-20	I3	nl	-	layer
21-26	F6.1	dt	d	time step
27-36	F10.0	ar	m2	area
37-46	F10.2	fam3	d m2	conv. factor from 0.01 mm d-1 to m3
47-53	F7.2	gl	m	soil surface
54-60	F7.2	hhgw	m	groundwater level
61-67	F7.2	hhsw	M	surface water level
68-74	F7.2	hhwr	M	weir/target level
75-84	F10.0	srsw	0.01 mm	storage in surface water
85-94	F10.0	srrz	0.01 mm	storage in root zone
95-104	F10.0	flru	0.01 mm d-1	runoff
105-114	F10.0	fldr01	0.01 mm d-1	drainage flux to 1st system
115-124	F10.0	fldr02	0.01 mm d-1	drainage flux to 2nd system
125-134	F10.0	fldr03	0.01 mm d-1	drainage flux to 3rd system
135-144	F10.0	fldr04	0.01 mm d-1	drainage flux to 4th system
145-154	F10.0	fldr05	0.01 mm d-1	drainage flux to 5th system
155-164	F10.0	fliw	0.01 mm d-1	inflow from inside modelling region
165-174	F10.0	flow	0.01 mm d-1	outflow
175-184	F10.0	flbdsw	0.01 mm d-1	inflow from outside modelling region
185-194	F10.0	flsu	0.01 mm d-1	supply
195-204	F10.0	flrv	0.01 mm d-1	abstraction for supply
205-214	F10.0	flsp	0.01 mm d-1	sprinkling from surface water
215-224	F10.0	flsr	0.01 mm d-1	decrease in storage
225-234	F10.0	fler	0.01 mm d-1	water balance error

N.B. The water balance cannot be considered for the surface water system per nodal subdomain, since it is calculated per subcatchment. Nevertheless the output is written to file. Therefore the water balance error may be considerable.

Soil water module output files

Root zone at the end (inrz_sim.out)

At the end of the SIMGRO calculations, the final groundwater heads, surface water levels and root zone contents are written to output files. These files may be used as input for a subsequent SIMGRO run. It suffices to rename the ".out" versions to ".inp" versions
A full description is given for inrz_sim.inp.

Water balances (wbun_****.out)

The description of this file is valid for all wbun****.out files. It includes a complete water balance of the unsaturated zone.

Variable format and description

col	format	name	unit	description
1-6	F6.2	dy	-	day
7-11	I5	yr	-	year
12-17	I6	nm	-	node/subcatchment/layer
18-20	I3	nl	-	layer
21-26	F6.2	dt	d	time step
27-36	F10.0	ar	m2	area
37-46	F10.2	fam3	d m2	conv. factor from 0.01 mm d-1 to m3
47-53	F7.2	gl	m	soil surface
54-60	F7.2	hhgw	m	groundwater level
61-67	F7.2	hhsw	m	surface water level
68-74	F7.2	hhwr	m	weir/target level
75-84	F10.0	srsw	0.01 mm	storage in surface water
85-94	F10.0	srrz	0.01 mm	storage in root zone
95-104	F10.0	flpr	0.01 mm d-1	precipitation
105-114	F10.0	flin	0.01 mm d-1	interception
115-124	F10.0	flru	0.01 mm d-1	runoff
125-134	F10.0	flse	0.01 mm d-1	flow to sewage system
135-144	F10.0	flev	0.01 mm d-1	evapotranspiration
145-154	F10.0	flpe	0.01 mm d-1	percolation
155-164	F10.0	flir	0.01 mm d-1	net irrigation
165-174	F10.0	flsrrz	0.01 mm d-1	decrease of root zone storage
175-184	F10.0	fler	0.01 mm d-1	water balance error